# Comment on "Drip Paintings and Fractal Analysis" by K. Jones-Smith, H. Mathur and L.M. Krauss (arXiv:0710.4917v2 [cond-mat.stat-mech])

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In a recent manuscript, Jones-Smith *et al.* attempt to use the well-established box-counting technique [2] for fractal analysis to "*demonstrate conclusively that fractal criteria are not useful for authentication*"[1]. Here, in response to what we view to be an extremely simplistic misrepresentation of our earlier work [3] by Jones-Smith *et al.*, we reiterate our position regarding the potential of fractal analysis for artwork authentication. We also point out some of the flaws in the analysis presented in [1] by Jones-Smith *et al.*

We begin by reiterating our position regarding the potential of our analysis [3] for the authentication of artwork. Jones-Smith *et al.* state that "*It has been claimed [1-6] that fractal analysis can be applied to unambiguously characterize works of art such as the drip paintings of Jackson Pollock*", "*...that all Pollock drip paintings satisfy these criteria [in their Ref. 6]*", and that "*...these characteristics [in their Ref. 6] are exclusive to Pollock*"[1]. These are misrepresentations of our recent paper [3] that Jones-Smith *et al.* use to portray our work as a 'black-box' authenticator, where an image is simply fed in one end and a final verdict of authentic or non-authentic pops out the other. This would be an amateur and superficial approach to authentication, akin to trying to solve a complex detective case with only one clue.

We strongly discourage this simplistic 'black-box' view of our results. In particular, we have never stated that the presence of these signatures proves that a painting is by Pollock, nor that their absence indicates a non-Pollock. We've merely pointed out that the presence or absence of fractal content in an artwork may be useful as one of the many clues needed to make an informed decision regarding the authenticity of an artwork. We have published one article regarding authenticity issues and it is very clear on this point [3]. This is further reinforced in Abbott's article [4] where Taylor is quoted directly as saying "*Taken in isolation, these results are not intended to be a technique for attributing a poured painting to Jackson Pollock. However, the results may be useful when coupled with other important information such as provenance, connoisseurship and materials analysis.*"

Looking now at two prominent flaws in this latest work by Jones-Smith *et al.* [1], we firstly note that their box-counting analysis regularly produces fractal dimensions $D > 2$ (e.g., for the composite layer in Untitled 1, white layer in Untitled 14, all layers in Free-form, black layer in Number 8, both layers in Composition with red and

black). This is an impossible result in a correctly written box-counting algorithm [2], which should always produce $1 \leqslant D \leqslant 2$ when applied to two-dimensional images such as the artwork considered by Jones-Smith *et al.* [1]. This points to a serious error in their box-counting analysis that causes it to produce incorrect counting statistics, and thereby, mathematically impossible results.

Secondly, we note that one of the key objections of Jones-Smith *et al.* to our work is that "*it is mathematically impossible for the visible portion of each layer and the composite to separately behave as fractals in a multi-layered painting.*" [1], a claim that was also made in their earlier paper [5] and rebutted in our response [6]. Given this, it is interesting to note the box-counting results obtained by Jones-Smith *et al.* for Pollock's 'The Wooden Horse' (Number 10A, 1948) [1]. In particular, they analyze the blue and black layers separately, and together as a composite (the PS result) and they find that all three are fractal. According to their earlier claims [5], this outcome is a mathematical impossibility, which either proves that their box-counting algorithm is producing incorrect results, or that their argument regarding the fractality of composites [5] is false. We conjecture that both are occurring, because although the results above show their box-counting algorithm produces incorrect results, our box-counting algorithm also shows that two layers and their composite can all show fractal behavior in certain cases. A more thorough presentation of the flaws in the work of Jones-Smith *et al.* will be the subject of a future publication.

In summary, we have highlighted two significant mathematical and logical flaws in the recent work by Jones-Smith *et al.* [1], such that the results should be treated with skepticism. We also reiterate that our recent work [3] is meant to contribute useful information towards the wealth of knowledge required to authenticate an artwork, it is not meant to be a 'black-box' authenticator as Jones-Smith *et al.* attempt to portray in their work [1, 5].

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